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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the static free of the spindle motor equipped with the air hydrodynamic bearing, or the body-of-revolution equipment which made this spindle motor the driving source of body of revolution.

[0002]

[Description of the Prior Art] The air hydrodynamic bearing is widely adopted as the spindle motor, especially the spindle motor for hard disk drive units. It is because it is extremely suitable for the bearing of the rotating machine for information machines and equipment since it has the feature of an air hydrodynamic bearing being light, and it being smoothly strong to heat cold the surroundings finely, and moreover lasting long. It will be as follows if the structure of an air hydrodynamic bearing is outlined. There are two kinds of air hydrodynamic bearings, a radial hydrodynamic bearing and a thrust hydrodynamic bearing. The radial air hydrodynamic bearing consists of pillar-like bearing material 4 by which the dynamic pressure generating slot G, for example, a herringbone slot, was formed in the periphery side, and cylinder-like bearing material 3 in which the inner skin is a smooth side and this pillar-like bearing material 4 is inserted by separating a narrow predetermined gap, as shown in drawing 2. Contrary to drawing 2, you may form the dynamic pressure generating slot G in a cylinder-like bearing material side. moreover, the disk-like thrust presser foot in which the dynamic pressure generating slot G, for example, a herringbone slot, was formed as a thrust air hydrodynamic bearing was shown in drawing 3 -- members 5 and 6 and a narrow predetermined gap are separated, and the aforementioned thrust presser-foot member is countered, and it is prepared, and the opposite side consists of disk-like thrust-section material by which a smooth side is not illustrated. Contrary to drawing 3, you may form the dynamic pressure generating slot G in the aforementioned disc-like thrust-section material side. The air hydrodynamic bearing used for a spindle motor usually combines two, a radial hydrodynamic bearing and a thrust hydrodynamic bearing.

[0003] By the way, the head of a high storage capacity type hard disk drive unit is the mainstream of present [MR head / using the magnetoresistance-effect element from which electric resistance changes according to change of a magnetic field]. However, if the hub which constructs across and carries out high-speed rotation of the hard disk is not grounded when it is an MR head, there is a possibility that an MR head may be damaged with static electricity generated in the hard disk. Although this carries out solid-state contact at the time of during starting and a halt if an air hydrodynamic bearing has the structure like **** and it does not provide a special means, it originates in the fundamental structure where a shaft and bearing do not contact at the time of operation. Then, although what is necessary is just to ground, it is not easy to ground the hub which carries out high-speed rotation. A crevice is established in the soffit of the rotation shaft 9 which the hub fixed to the upper limit at the same axle so that it may be shown in the former, for example, drawing 5. And the support plate 19 for a ground which fixed into the opposite portions of this and the base plate which counters is fixed. A crevice is established in the soffit of the aforementioned rotation shaft 9 as well as the part corresponding to a crevice, and there is the so-called static-free means of the metal contact method which constituted the static-free means from a metal sphere 18 for a ground which contacted these crevices mechanically and was held in them.

[0004]

[Problem(s) to be Solved by the Invention] However, the static-free means grounded using the metal sphere 18 for a ground like drawing 5 had the problem that friction between the metal sphere 18 and the crevice of the upper and lower sides holding this essentially checked the rotation of a low air hydrodynamic bearing with smooth load capacity. If it puts in another way, I hear that the greatest feature of an air hydrodynamic bearing called non-contacted bearing is checked, and it is. Therefore, this invention is that contact friction prepared between the hub which is the rotation section, and the base plate which is a fixed part offers the easy few and static-free means of structure in the spindle motor which adopted the air hydrodynamic bearing.

[0005]

[Means for Solving the Problem] As the point was buried possible [the rotation to the aforementioned conductive fluid] in the opposite portion of the base plate which accumulates in the soffit of a shaft, forms a hole, and injects a conductive fluid into this reservoir hole, and counters the soffit of the aforementioned shaft, a needlelike ground member fixed, and in the shaft rotation type spindle motor concerning this invention, or the body-of-revolution equipment which made this spindle motor the driving source of body of revolution, the static-free means which constituted a ground from a needlelike ground member and a conductive fluid the opposite portion of the base plate which fixes a needlelike ground member to the soffit of a shaft, and

similarly counters the soffit of this shaft in a shaft rotation type spindle motor -- accumulating -- a hole -- forming -- this reservoir hole -- the aforementioned needlelike ground -- the conductive fluid was poured in so that the point of a member might be buried possible [rotation], and the static-free means which constituted the ground from a needlelike ground member and a conductive fluid was established

[0006] Moreover, as the point was buried in the opposite portion of the hub which accumulates in the upper limit of a shaft, forms a hole, and injects a conductive fluid into this reservoir hole, and counters the upper limit of the aforementioned shaft possible [the rotation to the aforementioned conductive fluid], a needlelike ground member fixed, and the static-free means which constituted the ground from a needlelike ground member and a conductive fluid established in the shaft cover-half spindle motor concerning this invention, or the body-of-revolution equipment which made this spindle motor the driving source of the opposite portion of the hub which fixes a needlelike ground member to the upper limit of a shaft, and similarly counters the upper limit of this shaft in a shaft cover-half spindle motor -- accumulating -- a hole -- forming -- this reservoir hole -- the aforementioned needlelike ground -- the conductive fluid was poured in so that the point of a member might be buried possible [rotation], and the static-free means which constituted the ground from a needlelike ground member and a conductive fluid was established

[0007]

[Function] In the spindle motor equipped with the static-free means concerning this invention, or the body-of-revolution equipment which made this spindle motor the driving source of body of revolution Since a static-free means is constituted from a ground member needlelike like ****, and a reservoir hole where the conductive fluid like conductive grease was poured in the hub across which the hard disk which carries out high-speed rotation was constructed -- a needlelike ground member and this needlelike ground -- the point of a member was certainly grounded to the base plate through the aforementioned conductive fluid buried possible [rotation], and it was lost that a head is damaged of it with static electricity and the aforementioned ground -- since the frictional force between the point of a member and the aforementioned conductive fluid is very small, a spindle motor rotates smoothly

[0008]

[Embodiments of the Invention] Drawing 1 is one example of the shaft rotation type spindle motor concerning this invention. The cylinder-like supporter material by which 1 was set up by the base plate and 2 was set up by the base plate 1 in drawing 1, The cylinder-like bearing material supported by carrying out 3 on the same axle at the cylinder-like supporter material 2, the pillar-like bearing material by which insertion arrangement was carried out by 4 separating a narrow predetermined gap to the cylinder-like bearing material 3, and making it the same axle, The EP record-like upper thrust presser-foot member which 5 separated the narrow predetermined gap from the upper surface of the pillar-like bearing material 4, has been arranged, and fixed to the upper limit of the cylinder top supporter material 2, The EP record-like lower thrust presser-foot member which 6 separated the narrow predetermined gap from the inferior surface of tongue of the pillar-like bearing material 4, has been arranged, and fixed to the soffit of the cylinder-like supporter material 2, The stator coil by which 7 was attached in the periphery side of the cylinder-like supporter material 2, the Rota magnet which 8 has two incomes with a stator coil 7, and is made to generate turning effort, the shape of an abbreviation cup by which it fixed to the upper limit of a shaft 9 at the same axle by carrying out the shaft by which pressing fixing was carried out by making 9 into the pillar-like bearing material 4 at the same axle, and 10, and the Rota magnet 8 was attached in the inner skin -- it is a hub

[0009] The cylinder-like bearing material 3 and the pillar-like bearing material 4 constitute a radial air hydrodynamic bearing, and the herringbone slot G as shown in drawing 2 is formed in the inner skin of the cylinder-like bearing material 3, and one field of the periphery sides of the pillar-like bearing material 4, moreover, the upper-limit side of the pillar-like bearing material 4 and an upper thrust presser foot -- a member 5 -- the 1st thrust air hydrodynamic bearing -- constituting -- the same -- the soffit side of the pillar-like bearing material 4, and a lower thrust presser foot -- a member 6 also constitutes the 2nd thrust air hydrodynamic bearing the spiral slot G as shown in drawing 3 -- the 1st thrust air hydrodynamic bearing -- setting -- the upper-limit side of the pillar-like bearing material 4, and an upper thrust presser foot -- it forms in one field of the opposite sides of a member 5 -- having -- and the 2nd thrust air hydrodynamic bearing -- setting -- the soffit side of the pillar-like bearing material 4, and a lower thrust presser foot -- it is formed in one field of the opposite sides of a member 6

[0010] the needlelike ground of the metal fixed as the hole 12 and the conductive fluid 13 which collected and was injected into the hole 12 dug by the soffit of a shaft 9 to near a center along with the medial axis, and the nose of cam of the ground needle 18 were buried in the conductive fluid 13 by collecting and the static-free means contacted electrically [the disc-like supporter] to a base plate 1 -- it consists of members 17 The conductive grease with which the conductive fluid 13 mixed the metaled particle with the grease of hammer hardening is used. the 1st annular permanent magnet 15 fixes to the soffit of a shaft 9 -- having -- and the aforementioned needlelike ground -- the 2nd annular permanent magnet 16 arranged by making it the 1st permanent magnet 15 and reversed polarity at the needle side of a member has fixed These 1st permanent magnets 15 and the 2nd permanent magnet 16 constitute the magnetic bearing. Moreover, a conductive magnetic fluid is filled and it functions on the space between these 1st permanent magnets 15 and the 2nd permanent magnet 16 as a closure means against the conductive fluid 13.

[0011] a static-free means -- drawing 1 -- setting -- a needlelike ground -- although formed in the rotation [which the member 17 fixed to the base plate 1 which is a fixed side, and poured in the conductive fluid 13] shaft 9 whose hole it accumulates and is a rotation side, as shown in drawing 4, you may make these reverse namely, drawing 4 -- setting -- a needlelike ground -- the 2nd ground which the member 17 fixed to the soffit of the rotation shaft 9 which is a rotation side, and poured in another side and the conductive fluid 13 and whose hole it accumulates and is a fixed side -- it may be formed in a member 19

this 2nd ground -- a member 19 counters the soffit of the rotation shaft 9, is arranged, and fixes to a base plate 1
[0012] next, drawing 6 is boiled and one example of the shaft fixed type spindle motor concerning this invention is shown the bearing adopted as the shaft rotation type spindle motor of drawing 1 -- one radial air hydrodynamic bearing and two thrust air hydrodynamic bearings -- since -- it becomes -- it combined and was a hydrodynamic bearing on the other hand, the bearing adopted as the shaft fixed type spindle motor of drawing 6 -- one radial air hydrodynamic bearing and one thrust air hydrodynamic bearing -- since -- it becomes -- it combines and is a hydrodynamic bearing therefore, the EP record-like thrust presser foot which carried out the thrust air hydrodynamic bearing on a shaft 9 and the same axle at the base plate 1, and fixed in drawing 6 -- with a member 21 It consists of a member 22. this thrust presser foot -- a member 21 is countered, and a narrow predetermined gap is separated and arranged -- having -- the shape of an abbreviation cup -- the EP record-like thrust bearing which fixed in the open end section of a hub 10 -- and a thrust presser foot -- a member 21 and thrust bearing -- the spiral slot G as shown in drawing 3 is formed in one field of the opposite sides of a member 22

[0013] Moreover, the pillar-like bearing material 4 which carried out the radial air hydrodynamic bearing on the same axle at the fixed shaft 9, and fixed, It consists of cylinder-like bearing material 3 which fixed to the inner skin of a hub 10. this pillar-like bearing material 4 is inserted by making it the same axle, and separates and arranges a narrow predetermined gap -- having -- the shape of an abbreviation cup -- And the herringbone slot G as shown in drawing 3 is formed in the periphery side of the pillar-like bearing material 4, and one field of the inner skin of the cylinder-like bearing material 3. the Rota magnet 8 which the stator coil 7 is attached near the upper limit of a fixed shaft, and has two incomes with a stator coil 7, and is made to generate turning effort -- the shape of an abbreviation cup -- it is attached in the inner skin of a hub 10 face to face at the stator coil 7

[0014] the static-free means prepared in the shaft fixed type spindle motor of drawing 6 -- a needlelike ground -- a ground consists of a member 17 and a conductive fluid 13 namely, the needlelike ground which was dug by the upper limit of the fixed shaft 9 along with the medial axis and with which it accumulates, a hole 12 is formed, and the conductive fluid 13 like conductive grease is injected into this reservoir hole 12, and the nose of cam of the ground needle 18 was buried in this conductive fluid 13 -- a member 17 -- a shaft 9 and the same axle -- carrying out -- the shape of an abbreviation cup -- it has fixed in the center of the pars basilaris ossis occipitalis of a hub It was made such composition and the static-free means for fixed type spindle motors is realized. this -- reverse -- a needlelike ground -- the disk-like ground which fixed the member 17 to the fixed side, and poured in the conductive fluid 13 and with which it accumulated and the hole 20 was formed -- the static-free means for fixed type spindle motors which fixed the member 19 to the rotation side is also realizable

[0015]

[Effect of the Invention] this invention is prepared in the spindle motor equipped with the air hydrodynamic bearing for the static-free means into which the needlelike ground member and the conductive fluid were poured, and which accumulated and constituted the hole like ****. Therefore, the spindle motor concerning this invention certainly grounds the hub across which the hard disk which carries out high-speed rotation was constructed to a base plate through the ground member and the aforementioned conductive fluid of the shape of an aforementioned needle. in this case, a needlelike ground -- since contact friction between the nose of cam of the needle of a member and a conductive fluid is very small as compared with contact friction between the metal contacts which exist by the spindle motor equipped with the static-free means of the conventional metal contact method, it does not check the feature of the non-contacted bearing of an air hydrodynamic bearing Moreover, since a static-free means which accumulated and consisted of holes by which the needlelike ground member and the conductive fluid were poured in is easy structure, most of ease [manufacture] and maintenance is needlessness, and they cannot become almost further at the factor of a cost rise of a spindle motor.

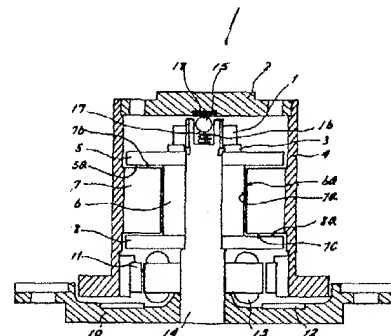
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(54) SPINDLE MOTOR

(11) 5-288214 (A) (43) 2.11.1993 (19) JP
 (21) Appl. No. 4-115552 (22) 8.4.1992
 (71) EBARA CORP (72) SHIYUNICHI AIYOSHIKAWA(1)
 (51) Int. Cl⁵. F16C17/02, F16C17/04

PURPOSE: To provide a spindle motor whose rotor (magnetic disk) can surely be earthed even if the motor uses a dynamic pressure bearing.

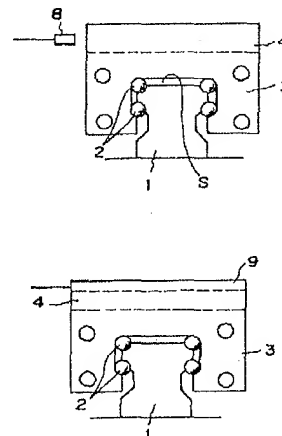
CONSTITUTION: A radial air dynamic pressure bearing and a thrust air dynamic pressure bearing comprised a stationary member having thrust plates 5, 8 made to directly abut and integrated to both end faces of a radial bearing member 6 and a radial sleeve 7 having its inner peripheral surface 7a and both end faces 7b, 7c freely rotatably supported, respectively, to the outer peripheral surface 6a of the radial bearing member 6 and the opposite surfaces 5a, 8a of the thrust plates 5, 8. The stationary member is passed through a fixed shaft 14 and is fixed thereto by a fixing nut 1. A cap-shaped rotor (hub 4 or rotation side member 2, etc.) is assembled to the outer periphery of the radial sleeve 7. A rotor magnet 11 opposite to a stator core 13 is secured to the rotor. A hole 17 is provided through the upper end face of the fixed shaft 14 and one end of a spring 16 is fixed to the bottom of the hole 17 and an electrically conductive material 15 bounced by the spring 16 is pressed against the center of rotation of the rotor.

**(54) RECTILINEAR MOTION GUIDE APPARATUS FOR CAUSING DISPLACEMENT**

(11) 5-288215 (A) (43) 2.11.1993 (19) JP
 (21) Appl. No. 4-115299 (22) 9.4.1992
 (71) YOTARO HATAMURA (72) YOTARO HATAMURA
 (51) Int. Cl⁵. F16C29/04

PURPOSE: To provide a rectilinear motion guide apparatus for causing displacement, capable of positioning at high accuracy and high resolving power.

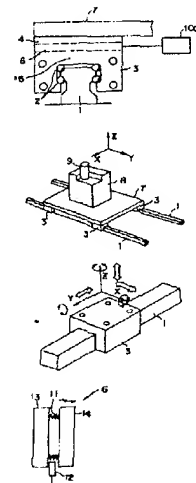
CONSTITUTION: A displacement portion 4 is provided in a sliding rest 3. The displacement portion 4 comprises an elastic member which can be deformed in the direction in which displacement is caused and is rigid in other directions and a displacement means 4 for expanding and contracting the elastic member. A displacement detection means 8 for detecting the displacement of the displacement portion 4 or a force detection means 9 for detecting forces is provided. The displacement of the displacement means 4 is adjusted according to values detected by the displacement detection means 8 or force detection means 9.

**(54) RECTILINEAR MOTION GUIDE APPARATUS EQUIPPED WITH FORCE DETECTION MEANS**

(11) 5-288216 (A) (43) 2.11.1993 (19) JP
 (21) Appl. No. 4-115297 (22) 9.4.1992
 (71) YOTARO HATAMURA (72) YOTARO HATAMURA
 (51) Int. Cl⁵. F16C29/04, G01L5/16

PURPOSE: To provide a rectilinear motion guide apparatus equipped with a force detection means capable of detecting actually applied forces with high accuracy and monitoring information about the forces.

CONSTITUTION: A sliding rest 3 comprises a mounting portion 4 on which a member 7 to be guided is mounted, a slide portion 5 having a portion on which a rolling element 2 rolls, and a force detection means 6 provided between the mounting portion 4 and the slide portion 5. The force detection means 6 comprises an elastic member 11 which can be elastically deformed in the direction in which forces work and a displacement (or distortion) detection means 12 for detecting displacement or distortion which vary according to the load of the elastic member 11 by converting the displacement (or distortion) into an electric signal. The elastic member 11 can be elastically deformed only in the direction in which the forces work and is rigid in other directions.

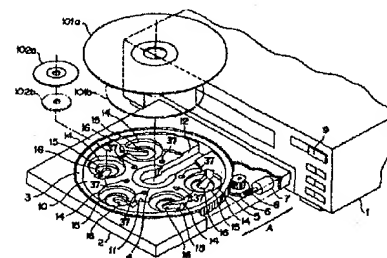


(54) POSITIONING DEVICE

- (11) 5-347063 (A) (43) 27.12.1993 (19) JP
 (21) Appl. No. 4-244040 (22) 21.8.1992 (33) JP (31) 92p.118434 (32) 13.4.1992
 (71) SONY CORP (72) SHUSAKU MARUKO(2)
 (51) Int. Cl.⁵ G11B17/24

PURPOSE: To enable selective recording/reproducing of disks having different diameters while simplifying the constitution.

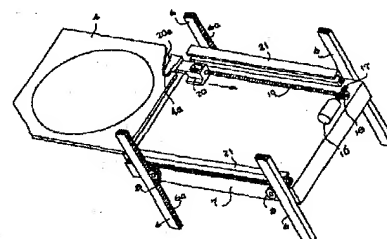
CONSTITUTION: On a turnable turntable 3, positioning recessed parts 10, 11 for the 1st, 2nd disks 101a, 101b having large diameters are concentrically provided and plural positioning recessed parts 14, 15 for the 3rd, 4th disks 102a, 102b having small diameters are discretely provided at the peripheral side. A disk table is operated to move over the center position and peripheral position of the turntable 3 so as to turn anyone of the disks 101a, 101b, 102a, 102b.

**(54) SELECTIVE CARRIER DEVICE FOR DISK CHANGER**

- (11) 5-347064 (A) (43) 27.12.1993 (19) JP
 (21) Appl. No. 4-181823 (22) 15.6.1992
 (71) FUNAI ELECTRIC CO LTD (72) SHIGEMI IWAKI
 (51) Int. Cl.⁵ G11B17/26

PURPOSE: To durability, to attain cost reduction and to largely improve reliability by reciprocally moving a pull-in lever by means of a thread body and a driving means.

CONSTITUTION: A thread shaft 19 rotated by a motor 16 is provided on the upper surface of an elevator 7 and the bisected slit nut 20a of a pull-in lever 20 is engaged with its tip. In order to load a tray 4, when the tray is made to move at the selected position of the tray by the motor mounted on the lower surface of the elevator, the hooking part 20a of the engaging body 20 is engaged with the engaging groove 4a of the tray 4. Then, by rotating the motor 16 in the prescribed direction, the tray 4 is shifted from the elevator 7 to a cabinet side. At the time of the ejection of the tray, the tray is moved from the cabinet 2 to the elevator side by reversely revolving the motor 16. Thus, the mechanism is extremely simplified.

**(54) MAGNETIC DISK DEVICE**

- (11) 5-347066 (A) (43) 27.12.1993 (19) JP
 (21) Appl. No. 4-156622 (22) 16.6.1992
 (71) NEC IBARAKI LTD (72) MASAOKI AOYANAGI
 (51) Int. Cl.⁵ G11B19/00, G11B19/20

PURPOSE: To prevent data on a magnetic head from being destroyed, which are caused by that a static electricity generated due to friction with an air during the rotation of a magnetic disk is charged on the magnetic disk and discharged the potential difference with the magnetic head.

CONSTITUTION: A conductive magnetic fluid 15 is used as an operating fluid for the bearing of a spindle motor using a dynamic pressure bearing to facilitate the conduction between a shaft 13 and a housing 11. Thus, the magnetic disk 2 is prevented from being charged by the static electricity, and the data are prevented from being destroyed.

